REMARKS

Claims 1-19 are pending in the application. Claims 1 and 3 have been amended to indicate that the liquid is allowed to move along the capillary under capillary action only. Support for the amendment can be found at page 4, lines 1-29. Claim 3 has also been amended to indicate that the velocity and the distance of the liquid column in the capillary is measured at time intervals using a camera with a computer-controlled image evaluation unit. Support for the amendment can be found in cancelled Claims 9 and 14-16. Claims 10 and 17-19 have been amended to read consistently with the amendments to Claims 1 and 3. No new matter has been added by way of the amendments.

Rejections under 35 U.S.C. § 102(b)

Claim 1 stands rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,554,821 to Kiesewetter et al. (hereinafter "Kiesewetter"). Applicants respectfully request reconsideration.

According to the amended claims, the present invention is directed to a method and device for determining the viscosities of liquids using a capillary. The method includes providing a horizontally arranged transparent capillary, which is open on both sides, and connected at one end of the capillary to a reservoir containing the liquid to be measured; allowing the liquid to move along the capillary under capillary action; and measuring the velocity and the distance of the liquid column in the capillary at time intervals using a camera with a computer-controlled image evaluation unit.

Kiesewetter discloses an apparatus for determining the viscosity of fluids that includes an outer housing including a front surface having a groove; a disposable capillary tube removably mounted in the groove and including at least one loop, each of the loops having two substantially horizontal branches including an upper branch and a lower branch for flowing the fluid under the influence of gravity through a predetermined path, and a device for measuring the rate of flow of the fluid along the path in one of the horizontal branches.

The apparatus disclosed in Kiesewetter includes a disposable capillary including at least one loop, each of the loops having two substantially horizontal

branches including an upper branch and a lower branch for flowing the fluid under the influence of gravity through a predetermined path (see abstract and col. 4, lines 1-59). In col. 4, lines 38-53, Kiesewetter teaches that because the measurement section is disposed in loops and arranged substantially in a horizontal plane, during the measurement a constant driving pressure differential delta p is present, acting over the height difference between the individual horizontally disposed branches. Kiesewetter provides a capillary arrangement which consists both of a vertically and of a horizontally disposed portion. This is achieved in that the capillary tube is disposed in meander form or in oppositely disposed loops. Thus, the flow of a fluid in a substantially horizontal tube and the flow of a fluid in a substantially perpendicular tube are superimposed.

The disclosure of Kiesewetter teaches away from the present invention in which a simple horizontally arranged transparent capillary is used. The flow of the liquid in the capillary results from capillary action only (page 3, lines 19-22; see Figure 1). No gravity forces act on the liquid column in the capillary, since the capillary is disposed horizontally over its entire length. There are no vertical or inclined sections in the capillary.

The present claims, as amended, specifically recite that a horizontally arranged transparent capillary is used and that the liquid moves along the capillary under capillary action.

In order to anticipate a claim, a prior art reference must disclose every limitation in the claim. Kiesewetter does not disclose using a horizontally arranged transparent capillary where the liquid moves along the capillary under capillary action only as required in Claim 1. Therefore Kiesewetter cannot anticipate the claim and the rejection of Claim 1 under 35 U.S.C. § 102(b) over Kiesewetter should be withdrawn.

Rejection under 35 U.S.C. § 103(a)

Claims 2-8 and 11-13 stand rejected under 35 U.S.C. § 103(a) as being obvious over Kiesewetter in view of U.S. Patent No. 6,732,574 to Hajduk et al. (hereinafter "Hajduk"). The Examiner suggests that it would have been obvious to use the electronic evaluation unit of Hajduk, in the apparatus of Kiesewetter to

perform measurements to increase the number and accuracy of samples to be analyzed. Applicants respectfully request reconsideration.

The discussion above regarding Kiesewetter is incorporated herein.

Hajduk discloses an apparatus and method for measuring viscosity of fluid samples in parallel using a plurality of tubes and reservoirs in fluid communication with the tubes. The apparatus also includes a mechanism for filling the reservoirs with the fluid samples, and a device for determining volumetric flow rates of fluid samples flowing from the reservoirs through the plurality of tubes simultaneously.

In order for obviousness to be established, the Examiner must show that the combined prior art discloses the elements of the claim and provide some motivation for combining the references to arrive at the claimed invention. No combination of Kiesewetter and/or Hajduk disclose or in any way suggest using a horizontally arranged transparent capillary where the liquid moves along the capillary under capillary action only.

Further, neither of Kiesewetter or Hajduk disclose or in any way suggest using a camera with a computer-controlled image evaluation unit to measure the velocity and the distance of the liquid column in the capillary as required in the amended Claims (see Claim 3 in particular).

Therefore the combination of Kiesewetter and Hajduk cannot render the claims obvious and the rejection of Claims 2-8 and 11-13 under 35 U.S.C. § 103(a) over Kiesewetter and Hajduk should be withdrawn.

Claims 9 and 14-16 stand rejected under 35 U.S.C. § 103(a) as being obvious over Kiesewetter in view of Hajduk and U.S. Patent No. 6,598,465 to Shin et al. (hereinafter "Shin"). The Examiner suggests that it would have been obvious to use the camera and image evaluation disclosed in Shin as the electronic evaluation unit of Hajduk, in the apparatus of Kiesewetter to increase the accuracy of measurements. Applicants respectfully request reconsideration.

Claim 9 has been cancelled and the limitations therein have been incorporated into Claim 3.

The discussion above regarding Kiesewetter and Hajduk is incorporated herein.

Shin discloses a scanning rheometer that uses a non-linear viscoplastic model, based on fluid height variation with respect to time. The rheometer includes a static or a dynamic source of fluid, a channel or slit whose sides form electrodes which are in contact with the flowing ER fluid, or a capillary tube exposed to a static/alternating magnetic field for flowing MR fluids, a transfer tube, either one or two riser tubes, and a column level detector for monitoring the column of fluid as it moves in one of the riser tubes. The column level detector is coupled to a processor which analyzes, among other things, column height vs. time data to determine both viscosity and yield stress.

The Examiner points to col. 11, lines 33-49 of Shin to support the assertion that the claimed camera with a computer-controlled image evaluation unit is disclosed therein. The relevant portion of this passage recites in part that a column level detector (e.g., a video camera) was used for measuring the fluid level by recording the fluid level with respect to time, in the riser tube, and was linearly traversed along a linear guide as the fluid level rose. The recorded images were magnified, and the fluid level was read using an image treatment tool (e.g., Paint Shop Pro™) to minimize reading errors.

In the present invention, the device and method include a capillary, a reservoir and an electronic evaluation unit, which characterizes the meniscus of the fluid in the capillary by the edge angle ϕ. The surface of the liquid column advances with a velocity v and has a length l. (See page 4, lines 13-19 of the specification). The velocity and the distance in the capillary are registered with a camera and the camera image is evaluated using image evaluation methods in real time or, after having carried out the experiment, with temporary storage of the raw data. (See page 7, lines 25-31 of the specification).

Also, the liquids can be doped by means of a fluorescent dye and read the position of the liquid column using a fluorescence detection method and cameras. (See page 8, lines 1-9 of the specification).

The method and apparatus of Shin relies on software, such as Paint Shop Pro™, which only allows for magnifying and digitizing an image, not measuring velocity and the distance in the capillary as in the present invention.

There is no disclosure or motivation in Shin, or in any combination of Shin and Kiesewetter and Hajduk that in any way suggests determining velocity and distance in the capillary with a camera and by evaluating the camera image using image evaluation methods in real time or, after having carried out the experiment, with temporary storage of the raw data as in the present invention.

Further, no combination of Kiesewetter, Hajduk, and/or Shin disclose or in any way suggest using a horizontally arranged transparent capillary where the liquid moves along the capillary under capillary action only.

Because the combined prior art does not disclose, suggest or motivate one skilled in the art to make the claimed device, the claims are not obvious over the cited art. As such, the rejection of Claims 9 and 14-16 under 35 U.S.C. § 103(a) should be withdrawn.

Claims 10 and 17-19 stand rejected under 35 U.S.C. § 103(a) as being obvious over Kiesewetter in view of Hajduk and U.S. Patent No. 6,681,616 to Spaid et al. (hereinafter "Spaid"). The Examiner suggests that it would have been obvious to use the fluorescence detection disclosed in Spaid as the electronic evaluation unit of Hajduk, in the apparatus of Kiesewetter to improve the analysis of clear fluids. Applicants respectfully request reconsideration.

The discussion above regarding Kiesewetter and Hajduk is incorporated herein.

Spaid discloses microfluidic devices, systems, and methods that measure viscosity, flow times, and/or other flow characteristics. Multi-reservoir pressure modulator and pressure controller systems, electrokinetic systems and/or other fluid transport mechanisms generate the flow and controllably mix fluids.

None of Kiesewetter, Hajduk, and/or Spaid disclose or in any way suggest using a camera with a computer-controlled image evaluation unit to measure the velocity and the distance of the liquid column in the capillary as required in the amended Claims.

Further, no combination of Kiesewetter, Hajduk, and/or Spaid disclose or in any way suggest using a horizontally arranged transparent capillary where the liquid to moves along the capillary under capillary action only.

Therefore the combination of Kiesewetter, Hajduk, and Spaid cannot render the claims obvious and the rejection of Claims 10 and 17-19 under 35 U.S.C. § 103(a) over Kiesewetter, Hajduk, and Spaid should be withdrawn.

CONCLUSION

Applicants believe that the present application is in condition for allowance. Accordingly, reconsideration of the rejections and a Notice of Allowance are respectfully requested for Claims 1-8, 10-13, 17-19. If the Examiner is of the opinion that the present application is in condition for other than allowance, he is requested to contact the Applicants' agent at the telephone number given below so that additional changes to the claims may be discussed.

Respectfully submitted,

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